THAT WHICH IS CLAIMED IS:

1. A reflector antenna system comprising:

at least one antenna reflector having an arcuate shape and defining a first antenna beam; and

a phased array antenna positioned in the first antenna beam and comprising

first and second arrays of antenna elements coupled together in back-to-back relation, said first array facing said at least one antenna reflector, and said second array facing away from said at least one antenna reflector, and

a controller connected to said first and second arrays of antenna elements and being switchable between a reflecting mode and a direct mode;

said controller when in the reflecting mode for causing a plurality of back-to-back pairs of first antenna elements from said first and second arrays to define at least one feed-through zone for the first antenna beam, and for causing a plurality of second antenna elements in said first array to define at least one first active zone for the first antenna beam;

said controller when in the direct mode for causing a plurality of antenna elements in said second array to define at least one second active zone for a second antenna beam.

2. The reflector antenna system of Claim 1 further comprising a transmitter, wherein said controller

connects said transmitter to said second antenna elements when in the reflecting mode, and wherein said controller connects said transmitter to said plurality of elements in said second array when in the direct mode.

3. The reflector antenna system of Claim 1 further comprising a receiver, wherein said controller connects said receiver to said second antenna elements when in the reflecting mode, and wherein said controller connects said receiver to said plurality of elements in said second array when in the direct mode.

4. The reflector antenna system of Claim 1 wherein said phased array antenna further comprises a respective phase shifter connected between each pair of back-to-back first antenna elements, and wherein said controller controls a phase of said phase shifters.

5. The reflector antenna system of Claim 1 wherein said phased array antenna further comprises a respective gain element connected between each pair of back-to-back first antenna elements, and wherein said controller controls a gain of said gain elements.

6. The reflector antenna system of Claim 1 wherein each of said antenna elements comprises a dipole antenna element comprising a medial feed portion and a pair of legs extending outwardly therefrom, and wherein adjacent legs of adjacent dipole antenna elements include respective spaced apart end portions.

7. The reflector antenna system of Claim 6 wherein the spaced apart end portions have predetermined shapes and relative positioning to provide increased capacitive coupling between said adjacent dipole antenna elements.

8. The reflector antenna system of Claim 6 further comprising a respective impedance element electrically connected between the spaced apart end portions of adjacent legs of adjacent dipole antenna elements.

9. The reflector antenna system of Claim 8 wherein each respective impedance element comprises at least one of an inductor and a capacitor.

10. A reflector antenna system comprising:

a transceiver;

at least one antenna reflector having an arcuate shape and defining a first antenna beam; and

a phased array antenna positioned in the first antenna beam and comprising

first and second arrays of antenna elements coupled together in back-to-back relation, said first array facing said at least one antenna reflector, and said second array facing away from said at least one antenna reflector, and

a controller connected to said first and second arrays of antenna elements and being

switchable between a reflecting mode and a direct mode;

said controller when in the reflecting mode for causing a plurality of back-to-back pairs of first antenna elements from said first and second arrays to define at least one feed-through zone for the first antenna beam, and for connecting said transceiver to a plurality of second antenna elements in said first array to define at least one first active zone for the first antenna beam;

said controller when in the direct mode for connecting said transceiver to a plurality of antenna elements in said second array to define at least one second active zone for a second antenna beam.

11. The reflector antenna system of Claim 10 wherein said phased array antenna further comprises a respective phase shifter connected between each pair of back-to-back first antenna elements, and wherein said controller controls a phase of said phase shifters.

12. The reflector antenna system of Claim 10 wherein said phased array antenna further comprises a respective gain element connected between each pair of back-to-back first antenna elements, and wherein said controller controls a gain of said gain elements.

13. The reflector antenna system of Claim 10 wherein each of said antenna elements comprises a dipole antenna element comprising a medial feed portion and a pair of legs extending outwardly therefrom, and wherein

adjacent legs of adjacent dipole antenna elements include respective spaced apart end portions.

14. The reflector antenna system of Claim 13 wherein the spaced apart end portions have predetermined shapes and relative positioning to provide increased capacitive coupling between said adjacent dipole antenna elements.

15. The reflector antenna system of Claim 13 further comprising a respective impedance element electrically connected between the spaced apart end portions of adjacent legs of adjacent dipole antenna elements.

16. The reflector antenna system of Claim 15 wherein each respective impedance element comprises at least one of an inductor and a capacitor.

17. A method for using a phased array antenna comprising first and second arrays of antenna elements coupled together in back-to-back relation, the method comprising:

positioning the phased array antenna in a first antenna beam defined by at least one antenna reflector having an arcuate shape so that the first array faces the at least one antenna reflector and the second array faces away from the at least one antenna reflector; and

selectively switching the phased array antenna between a reflecting mode and a direct mode by

causing a plurality of back-to-back pairs of first antenna elements from the first and second arrays to define at least one feed-through zone for the first antenna beam, and causing a plurality of second antenna elements in the first array to define at least one first active zone for the first antenna beam, to switch to the reflecting mode, and

causing a plurality of antenna elements in the second array to define at least one second active zone for a second antenna beam to switch to the direct mode.

18. The method of Claim 17 further comprising connecting the transmitter to the second antenna elements to switch to the reflecting mode, and connecting the transmitter to the plurality of elements in the second array to switch to the direct mode.

19. The method of Claim 17 further comprising connecting the receiver to the second antenna elements to switch to the reflecting mode, and connecting the receiver to the plurality of elements in the second array to switch to the direct mode.

20. The method of Claim 17 wherein the phased array antenna further comprises a respective phase shifter connected between each pair of back-to-back first antenna elements, and further comprising controlling a phase of the phase shifters.

21. The method of Claim 17 wherein the phased array antenna further comprises a respective gain element connected between each pair of back-to-back first antenna elements, and further comprising controlling a gain of the gain elements.

22. The method of Claim 17 wherein each of the antenna elements comprises a dipole antenna element comprising a medial feed portion and a pair of legs extending outwardly therefrom, and wherein adjacent legs of adjacent dipole antenna elements include respective spaced apart end portions.